Neutron Sciences Progress at Oak Ridge National Laboratory
January 2008

Summary

- HFIR Cycle 412 began December 18, 2007, and ended January 9, 2008. HFIR Cycle 413 began February 6, 2008 and will end February 29.
- SNS neutron operations began November 15 and ended February 3, 2008. SNS will resume neutron production April 2.
- SNS has an entry in the Guinness Book of Records as the "Most powerful pulsed neutron spallation source".

Instruments and Users

- For FY 2008 through January 2008, there were 83 unique users for HFIR and 39 for SNS.
- More than 200 proposals were submitted for 3 SNS and 5 HFIR instruments during the call for proposals ending January 2008.
- The first accepted publication for research performed with SNS data will soon appear in Physical Review Letters. The experiment was performed on the Liquids Reflectometer (BL-4B).
- The first magnetic field capabilities are now available for an SNS instrument (Magnetism Reflectometer, BL-4A). This magnet can produce fields up to 3 Tesla with a room temperature sample, or be used in conjunction with a cryocooler for sample temperature regulation from 5 K to 300K, and fields slightly higher than 1 Tesla. The system also provides sample rotation about an axis normal to the sample surface.
- The Spallation Neutrons and Pressure (SNAP, BL-3) instrument is now complete as the Instrument Readiness Review was held in December 2007 and the shutter opened on January 24, 2008, for the first time. This is the fifth SNS beam line to be opened. SNAP is designed for studies of materials under extreme temperature and pressure conditions. The increased neutron flux of SNS, combined with SNAP's large-volume pressure cells, will provide researchers with the opportunity to conduct neutron diffraction experiments over a large range of pressures never before available here in the USA. The unique capabilities of SNAP will prove particularly useful to studies in the earth and geological sciences. See http://neutrons.ornl.gov/instrument_systems/snap.shtml for more details.
- Progress continued with the following installation activities at other SNS instruments: the high-speed double-disk chopper for the Cold Neutron Chopper Spectrometer (CNCS, BL-5); all three tank sections and the T3 chopper on the Extended Q-Range SANS (EQ-SANS, BL-6); and the secondary shutter for Powder Diffractometer (POWGEN3, BL-11A).
- Construction began on the enclosure for the Single Crystal Diffractometer (TOPAZ, BL-12).
- The detector frame for the Fine-Resolution Fermi Chopper Spectrometer (SEQUOIA, BL-17) was installed.
- The BioSANS Laboratory casework has been installed and the lab is open to users at the HFIR. This is the first support lab in the HFIR Guide Hall and provides opportunities for wet chemistry and manipulation of biological samples.
- The sample environment box and pedestal was installed on BioSANS (CG-3) and provides for a vacuum enclosed environment for the samples and the sample changer. Beam extenders were installed on both SANS1 (CG-2) and BioSANS (CG-3) which extend the vacuum to the sample area and further reduce air scattering background.

Awards and Honors

- A new Guinness World Record has been confirmed for 'Most powerful pulsed neutron spallation source': *"The Spallation Neutron Source at the Oak Ridge National Laboratory (USA) is the most powerful of its kind in the world. By using a proton beam to pound a mercury target with more than 300 kilowatts of energy, it is able to produce 4.8x10^{16} neutrons per second. These neutrons will eventually be focussed into beams that will allow the molecular analysis of advanced materials."*
- Slava Danilov, an accelerator physicist within the Research Accelerator Division has been awarded the European Physical Society 2008 Achievement Prize "for an individual in the early part of his or her career, having made a recent, significant, original contribution to the accelerator field." His citation reads: "for numerous contributions to accelerator physics, in particular for the proposal, calculation, design, construction, and demonstration of efficient laser H- stripping."

Operations

- HFIR Cycle 413 began February 6, 2008 and will end February 29. The goals for the High Flux Isotope Reactor in FY 2008 are operation for 6 cycles with >90% predictability. A total of 72 in-vessel irradiation capsules were installed for cycle 412 to support medical isotope research, fusion reactor material research, and produce commercial isotopes.
- SNS cycle 2008-1 began on November 5, 2007, and ended February 3, 2008. The 60 Hz operation began January 7. Operational power levels increased from 120KW at the beginning of the run cycle to 340kW for three days at the end of the cycle. The Neutron Beam Production Reliability goal for this run cycle was 80% with 85.8% actually delivered. The next Neutron Production Cycle, 2008-2, will begin April 2 and extend to July 19; the operations goals this cycle are 1489 Hours of Neutron Production Beam delivered at 85% efficiency. Beam Power will peak at 750KW at the end of cycle 2008-2 with a total 725 MW-Hrs delivered.
- The SNS schedule in the coming months may be perturbed by the planned, but undetermined end of life of the first mercury target. This foreseen operational event will cause the shutdown of SNS for about two weeks while a new target is installed. Users will be notified as soon as possible and rescheduled to a future time. Our goal is to predict the target end of life and schedule future target replacements within normal maintenance periods.

Employment Opportunities

The following positions are in the Neutron Sciences Directorate or are related to neutron scattering: Click on "View Open Positions" at http://jobs.ornl.gov/ for additional details.

  - Neutron Diffraction Instrument Scientist (TOPAZ), ID 2656
  - SNS Neutron Scattering Sciences Division Director, ID 2631
- **Neutron Scattering Postdoctoral Fellowship Positions with ORNL through Oak Ridge Associated Universities** [description available at http://www.orau.gov/orise/edu/ornl/postneeds.htm]:
  - SNS Instrument Development Fellowship [ORNL08-51-NSSD]
  - Postdoctoral Research Fellow in Neutron Scattering – ARCS [ORNL08-32-NSSD]
  - Postdoctoral Research Associate: Protein Structure, Function & Dynamics [ORNL08-30-CSD]
  - Postdoctoral Research Associate: Molecular Computational Modeling [ORNL08-22-CSD]
  - Postdoctoral Research Associate: Virus Structure and Function, [ORNL08-21-NSSD]
  - Postdoctoral Research Associate: Bio-inspired Membrane Systems [ORNL08-20-CSD]
  - Postdoctoral Research Associate: Biopolymer Structure [ORNL08-19-CSD]
  - Neutron Scattering Postdoctoral Research Fellow [magnetic nanoparticles] [ORNL08-08-NSSD]
  - Computational Molecular Biophysics [ORNL08-01-BSD]
  - Neutron Scattering Postdoctoral Research Fellow [Macromolecular diffractometer] [ORNL07-82]
  - Neutron Scattering Postdoctoral Research Fellow [EQ-SANS] [ORNL07-72-NSSD]
  - Beam Instrumentation Post-Doc [ORNL07-64-NSD]
  - Control System Programmer [ORNL07-32-SNS]
- **Educational and Research Experiences**: ORNL has educational programs covering many scientific disciplines with the education continuum from pre-college through postgraduate including teachers and faculty. The main link to all of these programs is http://www.orau.gov/orise/edu/ornl/

Future meetings of interest to SNS and HFIR users

- Tutorial "Advances in neutron Scattering" at the American Physical Society, March 2008 meeting, March 9, 2008, New Orleans, LA. http://www.aps.org/meetings/march/others/premeeting/tutorials/4.cfm
- Workshop on Neutron Scattering Education, March 27-28, 2008, Washington, D.C. Contact Al Ekkebus, ekkebusae@ornl.gov, for more details.
- SNAP-COMPRES: A joint meeting exploring opportunities for elastic scattering using SNS and HE X-rays, April 13-15, 2008, Oak Ridge. http://www.compres.stonybrook.edu/Meetings/SNAP.pdf
- American Conference on Neutron Scattering, May 11-15, 2008, Eldorado Hotel, Santa Fe, NM. http://www.lansce.lanl.gov/acns2008/index.html
- American Crystallographic Association, *Annual Meeting*, May 31-June 5, 2008, Knoxville, TN. http://neutrons.ornl.gov/conf/aca2008/contact.shtml
- Annual meeting of the DOE Experimental Program to Stimulate Competitive Research (DOE EPSCoR), Oak Ridge, July 22-25, 2008.
- International Conference on Neutron Scattering, May 3-7, 2009, Knoxville, TN.